Product Engineering PUBLISHED MONTHLY

Index TO VOLUME XXIV - JANUARY to DECEMBER 1953

McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 36, N. Y.

EDITORIALS

The chariot to fame and glory.....Jan. 119
Prosperity in the USA: who has it? Jan. 240A
Why can't we do it too.....Feb. 117
Prosperity in the USA: how wealthy are we? .....Feb. 230A
Imaginary formulas .....Mar. 117
Prosperity in the USA: how deeply in debt are we? .....Mar. 166A
A graduate can measure a bottle...Apr. 135
For real help to small business...Apr. 264A
Stupid blind loyalty.....May 141
Smug engineering societies.....June 137
Man's most wonderful weapon.....July 139
Our heritage of negation.....Aug. 139
One sure way to get more defense for less money .....Aug. 236A
The understanding mind.....Sept. 127
Britons can have prosperity—if they want it .....Sept. 176A
Picturing the brain child.....Oct. 127
The reader and his mark.....Oct. 199
Conflict and dissatisfaction.....Nov. 127
Profits . . . how high are they?...Nov. 160A
Expensive fancies .....Dec. 127
What are profits used for?.....Dec. 224A

SPECIAL SECTIONS

The mechanics of industrial design Jan. 121
Design features of 1953 cars.....Feb. 135
Colored silicone finishes.....Mar. 167
Insuring your progress through research .....June 171
Organizing for industrial research June 172
Obtaining and keeping research personnel .....June 174
Measuring effectiveness of research personnel .....June 176
Policy matters in laboratory design June 180
Choosing and evaluating research projects .....June 184
Setting up research budgets...June 188
Patent licensing policy and procedures .....June 192
Role of independent research facilities .....June 196
Industry can use government research data .....June 200
Specification and color coding of electrical wire .....June 219
Design of V-belt drives for mass produced machines .....Sept. 154
Two-wheel V-belt drive design worksheet (gatefold) .....Sept. 160A
Using models in design.....Sept. 177
Rotating components for automatic control .....Nov. 129
Linear resistance potentiometers..Nov. 132
Nonlinear function generators....Nov. 136
Induction components .....Nov. 139
Synchros .....Nov. 142
Servo motors .....Nov. 147
Speed measuring devices.....Nov. 153
Miscellaneous control components Nov. 156
Typical application circuits.....Nov. 159

—A—

AEC reports .....Dec. 191
Abrasive belt replaces diamond wheel sharpener .....Feb. 203
Accelerations—calculator for G loadings .....Dec. 213
AD-X2: still a question .....Sept. 199
Adhesive bonded joints, criteria for designing .....Oct. 144
Adhesives for reinforced plastics (abstract) .....Apr. 288
Adhesives, metal-wood (abstract)..Jan. 251
Afterburner design pays off.....Apr. 215
Air compressor, largest four-stage centrifugal .....Apr. 222
Air control systems, pilot operated May 214
Aircraft design, pneumatics threaten hydraulic supremacy in.....Jan. 199
Aircraft designs .....Mar. 199
Aircraft-parachute brake .....June 232
Aircraft structures, ultra high strength steel for .....Oct. 129
Air jet controls weighing through unique spring assembly .....Aug. 168
Air jet operates environmental controls in test chamber.....Jan. 152
Aligning of orifices for measuring fluid flow .....Dec. 158
Aluminu, advances in (abstract)....Jan. 246
Aluminum aircraft alloys (abstract) June 308
Aluminum and magnesium alloys, charts for allowable compressive stresses in .....June 235
Aluminum honeycomb sandwich structures .....Feb. 184
Aluminum, how tough are nickel and chromium electrodes for.....Dec. 162
Aluminum structural design, cost and stress factors in (abstract).....Jan. 256
Aluminum tanks and pressure vessels Apr. 182
Amplifiers for automatic control, contactor .....Mar. 186
Amplifiers, increasing system reliability with magnetic (abstract).....Mar. 265
Analog circuit ratio chart .....Dec. 209
Analog computer .....May 176
Analogous systems in engineering design .....Jan. 184
Arc weld, torch.....May 225
Arctic testing .....July 202
Armored tank retriever .....Dec. 195
Atomic energy .....Oct. 123
Atomic energy control.....Feb. 113
Atomic energy data.....June 229
Atomic energy, industry shares.....Apr. 220
Atomic reactors, metals for (abstract) Dec. 292
Atom smashers ready to probe the nucleus, giant .....Feb. 201
Atomic pile for research purposes..Sept. 202
Automatic control, rotating components for .....Nov. 129
Linear resistance potentiometers..Nov. 132
Nonlinear function generators....Nov. 136
Induction components .....Nov. 139
Synchros .....Nov. 142
Servo motors .....Nov. 147
Speed measuring devices .....Nov. 153
Miscellaneous components .....Nov. 156
Typical application circuits.....Nov. 159
Automatic controls—making machines remember .....Apr. 141
Automatic recognizer may replace telephone dial .....Mar. 262
Automation, the facts about.....Dec. 129
Automobiles, British car hinges export appeal on economy.....July 162
Automobiles, Chrysler's car air-conditioner .....Nov. 180
Automobiles, Danes design low cost Jan. 200
Automobiles—design features of 1953 cars .....Feb. 135
Automobiles, Hudson's Italia.....Oct. 205
Automobiles, Kaiser Fiberglas reinforced plastic body .....Apr. 222
Automobiles, Mercedes Benz goes American .....Dec. 160
Automobiles, new Russian car—old Opel Kadett .....Nov. 184
Automobiles, 1954 parade .....Nov. 204
Automobiles, torque converter transmission for late Plymouth models..June 156
Automotive brake, hydraulic-pneumatic .....June 158
Aviation prophecies .....Sept. 197

—B—

Ball and roller bearings, chart for determining load and life of.....July 211
Ball and roller bearing greases, tests for .....Mar. 160
Ballast cleaner goes hydraulic, railroad .....Oct. 150
Basic principles of pneumatic operators Aug. 184
Bearing lubricant, selecting the right plain .....Mar. 134
Bearings by streak photography, study of lubricant flow in.....Oct. 162
Bearings, chart for determining load and life of ball and roller.....July 211
Bearings, high temperature lubrication of electric motor ball (abstract) Sept. 298
Bearings, jewel .....Aug. 186
Belt drives, mechanisms for adjusting tension of .....Oct. 168
Boats, hydrofoil .....Aug. 204
Bolted joints, improving fatigue resistance of .....Apr. 190
Bolts, properties of preloaded steel..Nov. 191
Brain, electronic, controls lab tests..Mar. 195
Brazed with several alloys, strength of joints in titanium.....July 141
Break-even charts: they'll tell you if a product should be made.....Aug. 179
British car hinges export appeal on economy .....July 162
British tractor .....Aug. 158
Brittle coating sensitivity, influence of strain gradient on.....Jan. 136
Brittle structural failures with emphasis on welded ships.....Apr. 192
Brown Boveri motor.....Mar. 146
Buckling shear stresses in thin cylinders, critical .....Apr. 225
Buick: V-8 and redesigned Dynaflow Feb. 162
Business machine, ring welding cuts costs .....Oct. 160
Business outlook .....Dec. 190

—C—

Cadillac: 12 volt ignition plus record horsepower .....Feb. 156
Calculating design data from sample gears .....July 215
Calculation of dihedral angles.....Aug. 212

Calculator for G loadings....Dec. 213
Calibrating multimillion pound testing machines....Oct. 176
Cam dynamics....Oct. 170
Camera, lightweight underwater...Mar. 136
Camera has fixed depth of field, tiny Minox....Apr. 163
Camera, mechanical drives in Neoflow reducing....May 168
Cams control automatic sewing machine, plastic....Mar. 140
Capacitor commutator tachometers....July 182
Capping machine, turret cams control rotary....Oct. 156
Car air-conditioner, Chrysler....Nov. 180
Carbides, cemented chrome....Aug. 154
Cast iron, wear properties of ductile....Feb. 125
Casting design, a practical approach to....July 192
Castings, investment....Apr. 137
Castings, tolerances and specifications of malleable (abstract)....Dec. 283
Catalysts....Feb. 209
Cathode-ray tube circuits for voltage and current analysis....Jan. 182
Cellular electronics....Aug. 211
Cemented chrome carbides....Aug. 154
Chart for determining load and life of ball and roller bearings....July 211
Charts for allowable compressive stresses in aluminum and magnesium alloys....June 235
Check-lists for springs....Sept. 185
Chevrolet: redesigns power-glide transmission....Feb. 160
Chinese engineering students....Sept. 284
Choosing and evaluating research projects....June 184
Chrome carbide gage block....Oct. 202
Chromium electrodes for aluminum, how tough are nickel and....Dec. 162
Chrysler: one oil system for engine and converter....Feb. 148
Circuits and applications of contactor control devices....Apr. 204
Clutches and couplings, silicone putty for slip....Oct. 142
Clutches, torque capacity and design of cone and disk....Dec. 182
Coatings to protect ferrous metals, wear resistant....Mar. 146
Cold welding, putting the squeeze on....Feb. 178
College financing aided....Apr. 216
Colmonoy spraywelded hard-facing alloys....Feb. 209
Color blindness relative to use of color-coded wire....Sept. 280
Color coding of electrical wire....June 219
Colored silicone finishes....Mar. 167
Combined stress problems, a graphical aid for....Jan. 207
Common rubber materials....Jan. 203
Components department aids project engineers (abstract)....Sept. 310
Components for automatic control, rotating....Nov. 129
Linear resistance potentiometers....Nov. 132
Nonlinear function generators....Nov. 136
Induction components....Nov. 139
Synchros....Nov. 142
Servo motors....Nov. 147
Speed measuring devices....Nov. 153
Miscellaneous control components....Nov. 156
Typical application circuits....Nov. 159
Compound characteristics from shunt wound machines....Mar. 164
Compounded polyvinyl chloride....Feb. 209
Compressive stresses in aluminum and magnesium alloys, charts for allowable....June 235
Computer....June 232
Computer, decimal....Nov. 202
Computer memories, new....Sept. 203
Computer, NBS designs "building block"....Mar. 205
Computer, the analog....May 176
Condensing unit, world's largest steam....May 227
Cone and disk clutches, torque capacity and design of....Dec. 182
Cones and pyramids, lateral area of right....Jan. 205
Construction equipment, winterization of....June 150
Consulting development groups....May 143
Contactor amplifiers for automatic control....Mar. 186
Contactor control devices, circuits and applications of....Apr. 204
Contest rewards versatility in design....Feb. 208
Continuous cast copper alloys, modern....Mar. 178
Control boards, keeping track of projects with....Sept. 141
Control components, miscellaneous...Nov. 156
Control devices, circuits and applications of contactor....Apr. 204
Control devices, electro-mechanical counters as....May 148
Control of double-acting pneumatic cylinders, remote....Sept. 170
Control systems, motor and gear train selection for automatic....Mar. 128
Control, rotating components for automatic....Nov. 129
Linear resistance potentiometers...Nov. 132
Nonlinear function generators...Nov. 136
Induction components....Nov. 139
Synchros....Nov. 142
Servo motors....Nov. 147
Speed measuring devices....Nov. 153
Miscellaneous control components....Nov. 156
Typical application circuits....Nov. 159
Converting decimal fractions into compound gear trains....June 215
Convertiplanes....Sept. 195
Conveyor belt, world's longest rubber....Apr. 328
Copper alloys, modern continuous cast....Mar. 178
Corrosion data, more....Sept. 200
Corrosion studies, optical....July 205
Cost and stress factors in aluminum structural design (abstract)....Jan. 256
Cost estimating, a simple approach to....July 178
Counters as control devices, electro-mechanical....May 148
Couplings, silicone putty for slip clutches and....Oct. 142
Creep testing in compression for simple creep assessment....Apr. 150
Criteria for designing adhesive bonded joints....Oct. 144
Critical buckling shear stresses in thin cylinders....Apr. 225
Curtailing patent rights....Nov. 199
Curved jaw stretch forming....Aug. 196
Curved surfaces, designing....Dec. 168
Cylinders, critical buckling shear stresses in thin....Apr. 225
Cylinders, high pressure (abstract)....Mar. 273

—D—

Damping techniques, servo....Oct. 193
Danes design low cost auto....Jan. 200
Dangerous new products cost manufacturers million....Jan. 200
Decimal computer....Nov. 202
Defense materials system....June 149
Design charts for rectangular wire helical springs....Nov. 207
Design engineer, what makes a successful....Apr. 279
Design factors for torque converter oil coolers (abstract)....Nov. 274
Design features of the 1953 cars....Feb. 135
Design of V-belt drives for mass produced machines....Sept. 154
Design tips for changing to die casting....Apr. 174
Designing an ideal sand casting....Feb. 168
Designing around inert-gas metal arc welded stainless, nickel and stainless clads, copper, copper base, alloys, aluminum....Apr. 171
Designing curved surfaces....Dec. 168
DeSoto: stresses new body styling..Feb. 150
Development engineer (abstract)...June 317
Development groups, consulting....May 143
Developments in the analysis of lugs and shear pins....June 160
Dictaphone, time-master....Dec. 150
Dictating machine redesigned for lower weight, higher quality....Dec. 150
Die casting design for easy ejection (abstract)....Apr. 283
Die casting, design tips for changing to....Apr. 174
Die castings and extrusions (abstract)....Oct. 266
Dihedral angles, calculation of....Aug. 213
Dimensional allowance charts for helical wire springs....Mar. 207
Dimensional tolerances for steel castings (abstract)....Nov. 269
Dimensioning, decimal (abstract)..Aug. 279
Disk clutches, torque capacity and design of cone and....Dec. 182
Dodge: gets new look and new V-8 engine....Feb. 152
Don't under-rate nylon for mechanical components....June 202
Drafting is in for a shake-up....Apr. 324
Drives for mass produced machines, design of V-belt....Sept. 154
Drives, mechanisms for adjusting tension of belt....Oct. 168
Dry radiography....Dec. 191
Ductile cast iron, wear properties of....Feb. 125
Duplicator, timing belts drive spindles in....May 162
Dynamic braking of squirrel cage motors....Aug. 178

—E—

Economy, review your products for....Aug. 282
Electric heating elements, typical industrial uses of....Mar. 184
Electrical insulation from mica paper, improved....May 210
Electrical radiant heating panel....Feb. 209
Electrical wire, specification and color coding of....June 219
Electroless plating....May 221
Electromagnets, nomographs for designing....May 229
Electro-mechanical counters as control devices....May 148
Electro-optical instrument analyzes chemical streams with infrared..May 174
Electrodes, braided....July 208
Electron scattering apparatus....Oct. 204
Electrons toughen plastics....July 209
Electronic aptitude tester....June 302
Electronic "brain" controls lab tests..Mar. 196
Electronic circuits—cathode-ray tube circuits for voltage and current analysis....Jan. 182
Tubes for industrial inspection and control....Feb. 182
Electronic design concept, project tinker-toy changes the....Dec. 134
Electronic equipment standardization on aircraft performance, effects of (abstract)....May 302
Electronic ejector tray....Apr. 158
Electronic paint spraying....Feb. 209
Electroplating, fatigue strength and (abstract)....Aug. 276
Electrostatic neutralizers, controlling static electricity with, Pt. I....Oct. 177
Pt. II....Nov. 167
End-welded threaded studs....May 227
Engine should power your equipment, which....Feb. 119
Engine control, remote (abstract)..Apr. 284
Engineering manpower....June 133
Engineering materials, new....June 139
Engineering societies—let's keep our eye on the ball....Oct. 148
Engineering mind....Feb. 260
Engineering personnel....Aug. 264
Engineering societies....June 299
Engineers salaries, professional....Aug. 210
Engineers, tough training backs Russian....Feb. 204
European machine tool tracer attachments....Jan. 142
Evaluating research projects, choosing and....June 184
Extrusion process, cold (abstract)..July 271
Extrusion press, another king size..Mar. 204
Extrusions, diecastings and (abstract)....Oct. 266
Extrusions—unitized designs are replacing built-up assemblies....May 199

—F—

Facts about automation....Dec. 129
Factors of safety in tolerance specifications....Mar. 155
Fatigue resistance of bolted joints, improving....Apr. 190
Fatigue testing—its machines and methods Pt. I....Feb. 128
Pt. II....Mar. 148
Felt standard sample file....Oct. 203
Film-type heating elements....Oct. 164
Filter drain....Sept. 150
Filters, metal powder....Apr. 179
Fine points in a product development program....Jan. 129
Finishes, colored silicone....Mar. 167
Flexible diaphragm acts as pump piston....Oct. 161
Flexure pivots—design formulas and charts....Feb. 192
Fluid circuits, multiple....Jan. 162
Fluorothene, properties of (abstract)....May 298
Foamed plastic materials....Apr. 166
Ford: principal change is in the suspension system....Feb. 140
Foreign news....Oct. 207
Foreign news....Nov. 201
Forging alloys, selecting....May 202
Forging heavy steel parts with split dies, press....Jan. 198
Formula for estimating wire size is revived....Oct. 280
Fretting, mechanism of (abstract)..Aug. 272
Friction drives, basic types of variable speed....Dec. 180
Function generators, nonlinear....Nov. 136
Fundamentals of selecting locknuts....Dec. 177

—G—

Gallium, metal of the future....Apr. 328
Garbage disposer....July 161
Garden tractor drive, floating countershaft controls....Nov. 182
Gas turbine, 1800 hp....Aug. 209
Gas turbine tanker, first....May 292
Gear, new facsimile....Nov. 203
Gear train selection for automatic control systems, motor and....Mar. 128
Gear trains, a simple method of determining ratios in planetary....Mar. 182
Gear trains, converting decimal fractions into compound....June 215
Gear trains, practical method for designing....Feb. 211
Gears, calculating design data from sample....July 215
Gears, sprockets, worms and ratchets, sheet metal....May 208
Gemmer power steering....Apr. 154
Geneva drives and special mechanisms, modified....Feb. 174
German engineering....July 285
German meters, circuit design feature....July 164
German research....Aug. 207
Glass fiber phenolic laminates, high temperature properties of (abstract)....Nov. 266
GM starts school magazine....Aug. 206
Government patent groups....Oct. 201
Government research data, industry can use....June 209

Government security ..... Sept. 123
Graphic tool pin-points production lags ..... Apr. 326
Graphical aid for combined stress problems ..... Jan. 207
Grating spectrometer ..... Jan. 201
Grease approach to lubrication, multi-purpose ..... July 174
Greases, tests for ball and roller bearing ..... Mar. 160
Grinder, Brown & Sharpe ..... Nov. 172
Guided missile test range ..... Dec. 188
Guided missiles ..... Mar. 113
Gyratory motion grinds polygons ... June 154

—H—

Heat pump, G.E. ..... Sept. 144
Heating elements, film-type ..... Oct. 164
Heating elements, typical industrial uses of electric ..... Mar. 184
Heating equipment, FCC curbs ..... July 288
Heavy press facts ..... June 227
Heavy press ..... Oct. 204
Heavy press parts ..... Apr. 220
Helical springs, design charts for rectangular wire ..... Nov. 207
Helical wire springs, dimensional allowance charts for ..... Mar. 207
Helicopter design lowers weight and increases payload, compact ..... Nov. 176
Hermetically sealed pump-motor units will handle any fluid ..... June 216
High purity metals ..... Nov. 186
High temperature non-critical materials (abstract) ..... Feb. 278
High temperature properties of glass fiber phenolic laminates (abstract) ..... Nov. 266
High temperature test data ..... Oct. 187
Hollow steel shafts, strength-weight ratios of ..... Sept. 209
Honeycomb element structure increases Geiger counter sensitivity ..... Dec. 160
Honeycomb sandwich structures, aluminum ..... Feb. 184
How fast does a spring expand ..... Oct. 209
How to evaluate assembly tolerances ..... Jan. 179
How to prevent oil seal failure ..... Jan. 154
How tough are nickel and chromium electrodes for aluminum? ..... Dec. 162
Hydraulic circuits, pressure surges in ..... Sept. 161
Hydraulic circuits, solenoid operated shutoff valves for aircraft ..... Mar. 175
Hydraulic fluid, which characteristics for ..... Aug. 149
Hydraulic fluids, synthetic (abstract) ..... Dec. 288
Hydraulic fuses (abstract) ..... Sept. 306
Hydraulic motor increases grinder's sizing accuracy ..... Nov. 172
Hydraulic-pneumatic automotive brake ..... June 158
Hydrofoil boats ..... Aug. 204

—I—

Improved electrical insulation from mica paper ..... May 210
Improving fatigue resistance of bolted joints ..... Apr. 190
Independent research facilities ..... June 196
Induction components ..... Nov. 139
Induction generator tachometer, performance characteristics of the ... Jan. 168
Industrial council conference ..... Dec. 192
Industrial design, mechanics of ..... Jan. 121
Industrial designers meet ..... Dec. 189
Industrial hydraulics conference ..... Dec. 278
Industrial research, organizing for ... June 172
Industrial uses of electric heating elements ..... Mar. 184
Industry can use government research data ..... June 200
Inert-gas metal arc welded stainless, nickel and stainless clads, copper, copper base alloys, aluminum ... Apr. 171
Influence of strain gradient on brittle coating sensitivity ..... Jan. 136
Inspection and control, tubes for industrial ..... Feb. 182
Instruction manuals ..... Aug. 141
Insuring your progress through research ..... June 171
Organizing for industrial research ..... June 172
Obtaining and keeping research personnel ..... June 174
Measuring effectiveness of research personnel ..... June 176
Policy matters in laboratory design ..... June 180
Choosing and evaluating research projects ..... June 184
Setting up research budgets ..... June 188
Patent licensing policy and procedures ..... June 192
Role of independent research facilities ..... June 196
Industry can use government research data ..... June 200
Integrated designs for solenoid operated shutoff valves ..... May 186
Investment castings: they're getting bigger ..... Apr. 137
Italian truck powered by lightweight diesel engine ..... Apr. 164

—J-K—

Japan's titanium industry ..... Dec. 191
Jet trainer, proposed ..... July 207
Jewel bearings, precision components for quality equipment ..... Aug. 186
Joints, criteria for designing adhesive bonded ..... Oct. 144
Kaiser, Fiberglas reinforced plastic body car ..... Apr. 222
Kaiser: luxury styling ..... Feb. 147
Keeping track of projects with control boards ..... Sept. 141
Kennedy dies, W. E. ..... Aug. 205

—L—

Laboratory design, policy matters in ..... June 180
Lateral area of right cones and pyramids ..... Jan. 205
Let's keep our eye on the ball ..... Oct. 148
Light metal building ..... Oct. 290
Lincoln: revs up to 205 horsepower .. Feb. 136
Linkage analysis to increase speed, spring actuated ..... July 152
Locknuts, selecting ..... Dec. 177
Locomotive powered by propane-burning gas turbine ..... Aug. 206
Low frequency induction heating for Alcoa ..... June 322
Low cost research to assure customer satisfaction ..... May 160
Lubricant flow in bearings by streak photography, study of ..... Oct. 162
Lubricant, selecting the right plain bearing ..... Mar. 134
Lubricating fluids, evaluation of synthesized high-temperature (abstract) ..... June 309
Lubrication of electric motor ball bearings, high temperature (abstract) ..... Sept. 298
Lubrication problems, painted-on film solves tough ..... Jan. 181
Lubricator, trolley wheel controls automatic Alemite ..... July 158
Lugs and shear pins, developments in the analysis of ..... June 160

—M—

McGraw dies, Curtis W. ..... Oct. 201
McGraw, Donald C. elected president. Nov. 202
Machine fits, new system for ..... Oct. 287
Machine tool tracer attachments, European ..... Jan. 142
Magnesium alloys, charts for allowable compressive stresses in aluminum and ..... June 235
Magnesium developments ..... Jan. 115
Magnetic amplifiers, increasing system reliability with (abstract) ..... Mar. 265
Magnetic drum storage devices ..... Aug. 192
Magnetic tape recording system for precision data (abstract) ..... May 308
Making machines remember ..... Apr. 141
Manpower board legislation ..... Aug. 211
Manpower program set-up for 1953. Mar. 196
Manuals, instruction ..... Aug. 141
Materials, high temperature non-critical (abstract) ..... Feb. 278
Materials, new engineering ..... June 139
Materials, residual compressive stress strengthens brittle ..... July 189
Materials shortages, protect yourself now against future ..... June 146
Mathematical operations, servo systems for performing ..... Sept. 134
Measurement units, changes in (abstract) ..... Dec. 281
Measuring effectiveness of research personnel ..... June 176
Mechanics of industrial design ..... Jan. 121
Mechanisms for adjusting tension of belt drives ..... Oct. 168
Mechanisms, modified Geneva drives and special ..... Feb. 174
Mechanisms, special purpose ..... Nov. 196
Mercedes Benz goes American ..... Dec. 160
Mercury: breathes easier ..... Feb. 140
Metal arc welded, inert-gas-stainless, nickel and stainless clads, copper, copper base alloys, aluminum .. Apr. 171
Metal, new light weight high luster ..... June 226
Metal powder filters ..... Apr. 179
1953 metal show ..... Oct. 202
Metal wear, seizing in (abstract) .. Sept. 304
Metal-wood adhesives (abstract) ... Jan. 251
Metallic beryllium flake ..... Nov. 202
Metallizing, vacuum (abstract) .... Oct. 274
Metals and plastics, nuclear radiation and mechanical properties of (abstract) ..... Oct. 268
Metals, effect of pressure on tensile properties of some (abstract) ... Aug. 268
Metals for atomic reactors (abstract) ..... Dec. 292
Metals, high purity ..... Nov. 186
Metals, paper-thin ..... Jan. 138
Metals, radiation characteristics of ..... Sept. 295
Metals, rare ..... Sept. 201
Mica in electrical design, glass bonded (abstract) ..... June 303
Mica paper, improved electrical insulation from ..... May 210
Micro-heat changes, device detects .. Mar. 198
Microwave spectrograph ..... Feb. 209
Military designs: are they too complex ..... Mar. 199
Military electronics ..... Aug. 206
Military trainer, first side-by-side ... Dec. 194
Miniature motor ..... Nov. 201
Miniature radio ..... Oct. 290
Minox camera ..... Apr. 163
Mobile lab aids defense contractors ..... Apr. 296
Mock-ups for vibration and shock testing ..... July 186
Models in design, using ..... Sept. 177
Modern continuous cast copper alloys ..... Mar. 178
Modified Geneva drives and special mechanisms ..... Feb. 174
Motor and gear train selection for automatic control systems ..... Mar. 128
Motor brake, tapered rotor supplies built-in ..... Mar. 146
Motorcycle starter acts as motor and generator, electrical ..... Aug. 168
Motors, causes of reduced speed in a-c (abstract) ..... May 294
Motors, dynamic braking of squirrel cage ..... Aug. 178
Motors for hazardous locations ..... July 148
Multiple fluid circuits ..... Jan. 162
Multi-purpose grease approach to lubrication ..... July 174

—N—

National Bureau of Standards ..... May 137
NATO rearmament, lack of standardization stalls ..... Jan. 196
Nay boys talk loudest ..... Oct. 262
NBS, changes at ..... Sept. 198
NBS designs "building block" computer ..... Mar. 205
NBS magnet magnetizer ..... June 221
NBS, scientists vindicate ..... Dec. 192
NBS studies high pressure pneumatics ..... July 181
Negators used for slot closure and counter balancing applications .. July 168
NEMA standards, what the new mean ..... Dec. 144
Neoprene mesh ..... Jan. 201
New approach to compression spring design ..... May 154
Noise reduction in machinery ..... Dec. 172
Nomogram for evaluating test data ..... Feb. 215
Nomographs for designing electromagnets ..... May 229
Nonferrous film for galvanizing ..... Oct. 279
Non-galling stainless ..... July 191
NSF travel grants ..... Sept. 199
Nuclear power pilot plant ..... July 207
Nuclear radiation and mechanical properties of metals and plastics (abstract) ..... Oct. 268
Nuclear system generates electricity ..... June 224
Nylon for mechanical components .. June 203

—O—

Obtaining and keeping research personnel ..... June 174
Oil circuit breaker, huge G.E. ..... Apr. 222
Oil coolers, design factors for torque converter (abstract) ..... Nov. 274
Oil seal failure, how to prevent .... Jan. 154
Oil whip—what it is and how to prevent it ..... Feb. 171
Oils for special lubrication problems, tailor-made ..... Mar. 166
Oldsmobile: sturdier design for 1953 ..... Feb. 168
Optical analysis ..... Apr. 217
Optical corrosion studies ..... July 206
Organizing for industrial research .. June 172

—P—

Packard: more horsepower means major changes ..... Feb. 142
Painted-on film solves tough lubrication problems ..... Jan. 181
Paper-thin metals ..... Jan. 138
Parachute brake ..... June 232
Passenger conveyor belt ..... Aug. 208
Patent law of 1953, new ..... Apr. 186
Patent licensing policy and procedures ..... June 192
Patent rights, curtailing ..... Nov. 199
Performance characteristics of the induction generator tachometer. Jan. 168
Personnel, measuring effectiveness of research ..... June 176
Personnel, obtaining and keeping research ..... June 174
Phenolic laminates, high temperature properties of glass fiber (abstract) ..... Nov. 266
Photographic typesetter, punched cards operate new ..... Apr. 218
Photography, study of lubricant flow in bearings by streak ..... Oct. 162
Physical properties checked optically ..... June 226
Pilot operated air control systems ... May 214
Pilot valve in float automatically operates filter drain ..... Sept. 150

Piston drives poppet in low pressure air control ..... Dec. 156
Piston-powered air liner, fastest ... July 206
Pivots, flexure ..... Feb. 192
Planetary gear trains, a simple method of determining ratios in ..... Mar. 182
Plastic cams control automatic sewing machine ..... Mar. 140
Plastic cuts lead-wire deterioration Mar. 264
Plastic design piracy ..... Sept. 203
Plastic extruder, multiple screw design in basis of ..... July 166
Plastic filter ..... June 231
Plastic materials, foamed ..... Apr. 166
Plastic moldings, large ..... Apr. 131
Plastic pipeline ..... Dec. 280
Plastic preforming ..... Nov. 198
Plastic tank trend ..... Oct. 203
Plastics, adhesives for reinforced (abstract) ..... Apr. 288
Plastics, nuclear radiation and mechanical properties of metals and (abstract) ..... Oct. 268
Plating, electroless ..... May 221
Plymouth: changes body and frame Feb. 150
Plymouth, torque converter transmission for late models ..... June 156
Pneumatic carrier ..... Dec. 154
Pneumatic cylinders, remote control of double-acting ..... Sept. 170
Pneumatic operators, basic principles of Aug. 184
Pneumatic safety circuits ..... July 196
Comment ..... Nov. 280
Pneumatic scales ..... Aug. 168
Pneumatics, NBS studies high pressure July 181
Pneumatics threatens hydraulic supremacy in aircraft design ..... Jan. 199
Policy matters in laboratory design June 180
Polyesters speed up motor production Mar. 198
Polygon universal grinding machine June 154
Pop rivet fasteners for aircraft ..... May 191
Porcelain cylinder liner protects pump for corrosive chemicals ..... May 166
Portable air starter compressor ..... Aug. 208
Potentiometers, linear resistance ... Nov. 132
Powder metal filters ..... Apr. 179
Powdered iron, more ..... Aug. 211
Power steering, using new materials Apr. 154
Power tools for front line troops, army studies 180-cycle ..... Feb. 207
Practical approach to casting design July 192
Practical method for designing gear trains ..... Feb. 211
Preloading controls tube reducing forces Sept. 148
Pressure surges in hydraulic circuits Sept. 161
Pressure vessels, aluminum tanks and Apr. 183
Prestraining affects copper properties Mar. 205
Printed circuits—project tinkertoy: it changes the electronic design concept ..... Dec. 134
Printed circuits, tinkertoy ..... Oct. 206
Product development program, fine points in a ..... Jan. 129
Professional societies ..... Jan. 244
Profile grinder, Planet ..... Apr. 160
Project tinkertoy: it changes the electronic design concept ..... Dec. 134
Prop reversal explained ..... Apr. 217
Properties and characteristics of foamed plastic materials ..... Apr. 166
Properties of preloaded steel bolts .. Nov. 191
Protect yourself now against future materials shortages ..... June 146
Pulse jet engine, valve design extends life of ..... Jan. 150
Pump for corrosive chemicals, porcelain cylinder liner protects ..... May 166
Pump-motor units will handle any fluid, hermetically sealed ..... June 216
Pumps have their niche, turbine ... Aug. 172
Punched cards operate new photographic typesetter ..... Apr. 218
Pure silicone for transistors ..... July 265
Putting the squeeze on cold welding Feb. 176
Pyrometer temperature compensation, linkage changes G.E. ..... Aug. 162

—R—

Radiation absorbers ..... Sept. 284
Radiation characteristics of metals Sept. 205
Radioactivity speeds up industrial research ..... Mar. 197
Radiography, hot (abstract) ..... Feb. 268
Railroad ballast cleaner goes hydraulic Oct. 150
Rare metals ..... Sept. 201
Recommended welding processes .... Apr. 229
Regulators, temperature ..... July 172
Remote control of double-acting pneumatic cylinders ..... Sept. 170
Research, basic ..... Aug. 135
Research budgets, setting up ..... June 188
Research costs mount ..... Mar. 198
Research department ..... Mar. 256
Research, European ..... Dec. 122
Research, German ..... Aug. 207
Research, insuring your progress through June 171
Organizing for industrial research June 172
Obtaining and keeping research personnel ..... June 174
Measuring effectiveness of research personnel ..... June 176
Policy matters in laboratory design June 180
Choosing and evaluating research project ..... June 184
Setting up research budgets ..... June 188
Patent licensing policy and procedures June 192
Role of independent research facilities June 196
Industry can use government research data ..... June 200
Research, operations (abstract) .... May 296
Research to assure customer satisfaction, low cost ..... May 160
Research, U.S. ..... Dec. 196
Residual compressive stress strengthens brittle materials ..... July 189
Review your products for economy .. Aug. 282
Ring welding cuts business machine costs ..... Oct. 160
Rings on carrier "dial" airtube stations Dec. 154
Rivet fasteners for aircraft, pop .... May 191
Rivets for big jobs, small ..... Mar. 119
Robot scanner for bearings ..... Oct. 279
Roller bearing greases, tests for ball and Mar. 160
Roller bearings, chart for determining load and life of ball and ..... July 211
Rotary capping machine ..... Oct. 156
Rotating components for automatic control ..... Nov. 129
Linear resistance potentiometers . Nov. 132
Nonlinear function generators .... Nov. 136
Induction components ..... Nov. 139
Synchros ..... Nov. 143
Servo motors ..... Nov. 147
Speed measuring devices ..... Nov. 153
Miscellaneous control components. Nov. 156
Typical application circuits ..... Nov. 159
Rubber diaphragm replaces metal nozzle in home shower head .... May 174
Rubber materials, common ..... Jan. 203
Rubber monopoly, synthetic ..... Apr. 212
Rubber packings for high temperature application, synthetic (abstract) . July 274
Rubber parts and assemblies, tips for designing ..... Jan. 160
Rubber phenolics (abstract) ..... Mar. 268
Rubber-to-metal joints, design of bonded (abstract) ..... July 277
Ruggedize precision instrument, De Jur July 168
Russian car—old Opel Kadett, new . Nov. 184
Russian engineers, tough training backs Feb. 204
Russian lathe ..... Aug. 205
Russian television sets ..... Nov. 200

—S—

Safety circuits, pneumatic ..... July 196
Comment ..... Nov. 280
Safety suggestions for pneumatic circuits Nov. 280
Safer ejection seats ..... Sept. 199
Salaries, professional engineers ..... Aug. 210
Sand casting, designing an ideal .... Feb. 168
Sans, souci
Professional societies ..... Jan. 244
Engineering mind ..... Feb. 260
Research department ..... Mar. 256
Status of engineers ..... Apr. 276
Engineering societies ..... June 299
German engineering ..... July 285
Engineering personnel ..... Aug. 265
Standardizing behavior ..... Sept. 265
Nay boys talk loudest ..... Oct. 262
Salesmen ..... Dec. 274
Scientists vindicate NBS ..... Dec. 193
Seizing in metal wear (abstract) ... Sept. 304
Selecting forging alloys ..... May 202
Selecting the right plain bearing lubricant ..... Mar. 134
Servo damping techniques ..... Oct. 193
Servo mechanism components ..... July 135
Servo motors ..... Nov. 147
Servo systems for performing mathematical operations ..... Sept. 134
Setting up research budgets ..... June 188
Seven methods for solving structural test problems ..... Sept. 172
Sewing machine, plastic cams control automatic ..... Mar. 140
Shaft mounted speed reducers ..... July 170
Shafts, strength-weight ratios of hollow steel ..... Sept. 209
Shear pins, developments in the analysis of lugs and ..... June 160
Shear stresses in thin cylinders, critical buckling ..... Apr. 225
Sheet metal design with the $ sign in mind ..... Oct. 188
Sheet metal gears, sprockets, worms and ratchets ..... May 208
Shell molding cartel ..... May 222
Shell molding of stainless steel ..... Sept. 199
Shell molding progress ..... Nov. 201
Shell molding uses more resin ..... Mar. 198
Shock or vibration isolators ..... June 212
Shock waves created in miniature .. July 206
Shower head, rubber diaphragm replaces metal nozzle in home ..... May 174
Shunt wound machines, compound characteristics from ..... Mar. 164
Silicone finishes, colored ..... Mar. 167
Silicone putty for slip clutches and couplings ..... Oct. 142
Simple approach to cost estimating . July 178
Simple method of determining ratios in planetary gear trains ..... Mar. 182
Simplified analysis of complex vibration problems ..... Nov. 161
Sintered parts, sprayed and (abstract) Feb. 272
Skypark, hydraulic pushbutton-operated Dec. 194
Small rivets for big jobs ..... Mar. 119
Smokestack, first glass-lined steel .. July 207
Soil corrosion measured electrically . Feb. 203
Soldering, production (abstract) .... July 279
Solenoid operated shutoff valves for aircraft hydraulic circuits ..... Mar. 175
Solenoid operated shutoff valves, integrated designs for ..... May 186
Solenoid valves channel heat pump refrigerant ..... Sept. 144
Special purpose mechanisms ..... Nov. 196
Specification and color coding of electrical wire ..... June 219
Speed measuring devices ..... Nov. 153
Speed reducers, shaft mounted ..... July 170
Spring actuated linkage analysis to increase speed ..... July 152
Spring expand, how fast does a .... Oct. 209
Springs, check-lists for ..... Sept. 185
Springs, design charts for rectangular wire helical ..... Nov. 207
Sprockets, worms and ratchets, sheet metal gears ..... May 208
Sprayed and sintered parts (abstract) Feb. 272
Spring design, compression ..... May 154
Springs, dimensional allowance charts for helical wire ..... Mar. 207
Square root extraction ..... Mar. 286
Square root without a calculating machine ..... May 313
Sr-4 gages to measure strains in wire strand ..... Apr. 214
Stainless, new non-galling ..... July 191
Stainless steel, shell molding of .... Sept. 129
Standardizing behavior ..... Sept. 265
Standards, Metal Powder Association Feb. 209
Static electricity with electrostatic neutralizers, controlling, Pt. I ..... Oct. 177
Pt. II ..... Nov. 167
Status of engineers ..... Apr. 276
Steel bolts, properties of preloaded . Nov. 191
Steel castings, dimensional tolerances for (abstract) ..... Nov. 269
Steel for aircraft structures, ultra high strength ..... Oct. 129
Steel tubing cuts Bourdon tube rejects, chrome-moly ..... Mar. 139
Storage devices, magnetic drum .... Aug. 192
Strain gages to measure wire strand . Apr. 214
Strength of joints in titanium brazed with several alloys ..... July 141
Strength-weight ratios of hollow steel shafts ..... Sept. 209
Stress strengthens brittle materials, residual compressive ..... July 189
Stretch forming, curved jaw ..... Aug. 196
Stretcher, most powerful ..... Oct. 205
Structural failures with emphasis on welded ships, brittle ..... Apr. 192
Studebaker: sport car styling for all models ..... Feb. 167
Study of lubricant flow in bearings by streak photography ..... Oct. 162
Sub-zero technique in engineering (abstract) ..... Feb. 266
Supersonic fighter, new ..... Dec. 195
Supply of engineers, stretching .... Jan. 197
Synchros ..... Nov. 143
System for machine fits, new ..... Oct. 287
System training ..... Nov. 203

—T—

Tachometer, performance characteristics of the induction generator ..... Jan. 168
Tachometers, capacitor commutator . July 182
Tank designs ..... Mar. 199
Tanks and pressure vessels, aluminum Apr. 183
Tanning acid ..... Feb. 209
Tapered rotor supplies built-in motor brake ..... Mar. 146
Techniques for measuring and controlling vacuum ..... Sept. 190
Teflon, transitions in ..... May 185
Temperature regulators ..... July 172
Tensile testing at high and low temperatures ..... Aug. 197
Test chamber, air jet operates environmental controls in ..... Jan. 152
Test data and their importance in design, high temperature ..... Oct. 182
Test data, nomogram for evaluating . Feb. 215
Test problems, seven methods for solving structural ..... Sept. 172
Testing, arctic ..... July 202
Testing at high and low temperatures, tensile ..... Aug. 197
Testing at subatmospheric temperatures, tension (abstract) ..... Mar. 276
Testing in compression for simple creep assessment, creep ..... Apr. 150
Testing machines, calibrating multimillion pound ..... Oct. 176
Testing machine, world's largest vertical universal ..... Apr. 223
Testing, mock-ups for vibration and shock a ..... July 186

Tests for ball and roller bearing greases Mar. 160
Three D record keeping....July 208
Three-point suspension spreads tractor weight, British ....Aug. 158
Timing belts drive spindles in duplicator May 162
Tinkertoy ....Oct. 206
Tinkertoy project: it changes the electronic design concept....Dec. 134
Tips for designing rubber parts and assemblies ....Jan. 160
Titanium brazed with several alloys, strength of joints in....July 141
Titanium industry, Japan's....Dec. 191
Titanium parts ....Oct. 202
Titanium production, more....Sept. 203
Titanium process, more on....July 204
Tolerance specifications, factors of safety in ....Mar. 155
Tolerances for steel castings, dimensional (abstract) ....Nov. 269
Tolerances assembly ....Jan. 179
Torch arc weld....May 225
Torque capacity and design of cone and disk clutches ....Dec. 182
Torque converter oil coolers, design factors for (abstract) ....Nov. 274
Torque converter transmission for late Plymouth models ....June 156
Tough training backs Russian engineers ....Feb. 204
Tracer attachments, European machine tool ....Jan. 142
Traffic controller has jack-mounted components, electro-mechanical ....May 172
Transformer models pay high dividends Apr. 298
Transistor applications, experimental (abstract) ....May 310
Transistors enter commercial field..Mar. 197
Transistors, improvements in (abstract) Nov. 278
Transistors, new ....Sept. 201
Trolley wheel controls automatic lubricator ....July 158
Tube reducer ....Sept. 148
Tubes for industrial inspection and control ....Feb. 182
Tungsten institute formed ....Oct. 203
Turbine pumps have their niche...Aug. 172
Turbocharger increases compressor efficiency ....Oct. 158
Turboprops to power transports....Oct. 200
Turret cams control rotary capper..Oct. 156
Turret unit for multiple indexing applications, standard ....Nov. 184
Two-wheel V-belt drive design worksheet ....Sept. 160A

—U—

Ultra high strength steel for aircraft structures ....Oct. 129
Underwater camera ....Mar. 136
Unitized designs are replacing built-up assemblies ....May 199
Urea formaldehyde, modified....Jan. 201
Using models in design....Sept. 177

—V—

Vacuum metallizing (abstract)....Oct. 274
Vacuum, techniques for measuring and controlling ....Sept. 190
Valve design extends life of pulse jet engine ....Jan. 150
Valve, flexible ....Aug. 164
Valves for aircraft hydraulic circuits, solenoid operated shutoff....Mar. 175
Valves, integrated designs for solenoid operated shutoff ....May 186
V-belt drive design worksheet, two-wheel Sept. 160A
V-belt drives for mass produced machines, design of....Sept. 154
Vender capacity doubled within same frame size ....Sept. 152
Vibration and shock testing, mock-ups for ....July 186
Vibration isolators, shock or....June 212
Vibration pickup calibrator....Nov. 166
Vibration problems, simplified analysis of complex ....Nov. 161
Voltage and current analysis, cathode-ray tube circuits for....Jan. 182

—W-Z—

Water cooler, G. E....Aug. 166
Water treatment ....Nov. 123
Wear properties of ductile cast iron..Feb. 125
Welding idea: braided electrodes...July 208
Welding processes, recommended..Apr. 229
Welding, putting the squeeze on cold Feb. 176
Weston instrument, bridge-type design Mar. 144
What makes a successful design engineer ....Apr. 279
What the new NEMA standards mean Dec. 144
Which characteristics for hydraulic fluid? ....Aug. 149
Which engine should power your equipment? ....Feb. 119
Willys: adds new models to the line..Feb. 155
Winterization of construction equipment ....June 150
Wire size, formula for estimating..Oct. 280
Wrap-around connections ....June 230
WSB clarifies engineer definition....Jan. 199
Zirconium, ductile welds in (abstract) July 266
Zirconium shortage eases....May 224

CLASSIFIED INDEX

DESIGN ANALYSIS AND CALCULATIONS

Aluminum structural design, cost and stress factors in (abstract)....Jan. 256
Analog circuit ratio chart....Dec. 209
Analog computer ....May 176
Analogous systems in engineering design ....Jan. 184
Brittle structural failures with emphasis on welded ships ....Apr. 192
Calculation of dihedral angles....Aug. 213
Calculator for G loadings....Dec. 213
Cam dynamics ....Oct. 170
Charts for allowable compressive stresses in aluminum and magnesium alloys June 235
Computer ....June 232
Converting decimal fractions into compound gear trains ....June 215
Critical buckling shear stresses in thin cylinders ....Apr. 225
Dangerous new products cost manufacturers million ....Jan. 200
Decimal computer ....Nov. 202
Design of V-belt drives for mass produced machines ....Sept. 154
Designing curved surfaces ....Dec. 168
Developments in the analysis of lugs and shear pins ....June 160
Electronic "brain" controls lab tests Mar. 195
Factors of safety in tolerance specifications ....Mar. 155
Flexure pivots—design formulas and charts ....Feb. 192
Formula for estimating wire size is revived ....Oct. 280
Graphical aid for combines stress problems ....Jan. 207
How to evaluate assembly tolerances Jan. 179
Improving fatigue resistance of bolted joints ....Apr. 190
Influence of strain gradient on brittle coating sensitivity ....Jan. 136
Lateral area of right cones and pyramids Jan. 205
Military designs: are they too complex Mar. 199
Mock-ups for vibration and shock testing ....July 186
New approach to compression spring design ....May 154
Noise reduction in machinery ....Dec. 172
Pressure surges in hydraulic circuits Sept. 161
Research, operations (abstract) ..May 296
Residual compressive stress strengthens brittle materials ....July 189
Servo damping techniques ....Oct. 193
Shock or vibration isolators ....June 212
Simple method of determining ratios in planetary gear trains....Mar. 182
Simplified analysis of complex vibration problems ....Nov. 161
Spring actuated linkage analysis to increase speed ....July 152
Two-wheel V-belt drive design worksheet ....Sept. 160A

ELECTRIC MOTORS, PARTS AND CONTROLS

Capacitor commutator tachometers..July 182
Circuits and applications of contactor control devices....Apr. 204
Color blindness relative to use of color-coded wire ....Sept. 280
Compound characteristics from shunt wound machines ....Mar. 164
Contactor amplifiers for automatic control ....Mar. 186
Control components, miscellaneous..Nov. 156
Controlling static electricity with electrostatic neutralizer
Pt. I ....Oct. 177
Pt. II ....Nov. 167
Dynamic braking of squirrel cage motors ....Aug. 178
Electro-mechanical counters as control devices ....May 148
Electro-optical instrument analyzes chemical streams with infrared..May 174
Engine control, remote (abstract)...Apr. 284
Facts about automation....Dec. 129
Film-type heating elements....Oct. 164
Function generators, nonlinear....Nov. 136
Gear, new facsimile....Nov. 203
German meters, circuit design feature ....July 164
Hermetically sealed pump-motor units will handle any fluid....June 216
Improved electrical insulation from mica paper ....May 210
Induction components ....Nov. 139
Industrial uses of electric heating elements ....Mar. 184
Integrated designs for solenoid operated shutoff valves ....May 186
Italian truck powered by lightweight diesel engine ....Apr. 164
Magnetic amplifiers, increasing system reliability with (abstract)....Mar. 265
Magnetic drum storage devices....Aug. 192
Magnetic tape recording system for precision data (abstract)....May 308
Making machines remember....Apr. 141
Motor and gear train selection for automatic control systems ....Mar. 128
Motors, causes of reduced speed in a-c (abstract) ....May 294
Motors for hazardous locations....July 148
NBS magnet magnetizer....June 231
Nomographs for designing electromagnets ....May 229
Performance characteristics of the induction generator tachometer ..Jan. 168
Potentiometers, linear resistance....Nov. 132
Power tools for front line troops, army studies 180-cycle ....Feb. 207
Project tinkertoy: it changes the electronic design concept....Dec. 134
Rotating components for automatic control ....Nov. 129
Linear resistance potentiometers..Nov. 132
Nonlinear function generators....Nov. 136
Induction components ....Nov. 139
Synchros ....Nov. 143
Servo motors ....Nov. 147
Speed measuring devices....Nov. 153
Miscellaneous control components Nov. 156
Typical application circuits....Nov. 159
Ruggedized precision instrument ..July 168
Servo damping techniques....Oct. 193
Servo mechanism components....July 135
Servo motors ....Nov. 147
Servo systems for performing mathematical operations ....Sept. 134
Specification and color coding of electrical wire ....June 219
Speed measuring devices....Nov. 153
SR-4 gages to measure strains in wire strand ....Apr. 214
Synchros ....Nov. 143
Tapered rotor supplies built-motor brake Mar. 146
Traffic controller has jack-mounted components, electro-mechanical ....May 172
What the new NEMA strandars mean Dec. 144
Which engine should power your equipment? ....Feb. 119
Wrap-around connections ....June 230

ELECTRONIC UNITS AND CIRCUITS

Analog circuit ratio chart....Dec. 209
Analog computer ....May 176
Analogous systems in engineering design Jan. 184
Cathode-ray tube circuits for voltage and current analysis ....Jan. 182
Circuits and applications of contactor control devices ....Apr. 204
Components department aids project engineers (abstract)....Sept. 210
Contactor amplifiers for automatic control ....Mar. 186
Control components, miscellaneous..Nov. 156

Electronic aptitude tester.....June 302
Electronic "brain" controls lab tests.Mar. 195
Electronic ejector tray.....Apr. 158
Electronic equipment standization on aircraft performance, effects of (abstract) .....May 302
Facts about automation.....Dec. 129
Function generators, nonlinear.....Nov. 136
Gear, new facsimile.....Nov. 203
Improvements in transistors (abstract) Nov. 278
Induction components .....Nov. 139
Magnetic amplifiers, increasing system reliability with (abstract).....Mar. 265
Making machines remember.....Apr. 141
Motor and gear train selection for automatic control systems.....Mar. 128
NBS designs "building block" computer Mar. 205
Performance characteristics of the induction generator tachometer..Jan. 168
Potentiometers, linear resistance...Nov. 132
Printed circuits, tinkertoy.....Oct. 206
Project tinkertoy: it changes the electronic design concept.....Dec. 134
Rotating components for automatic control .....Nov. 129
Linear resistance potentiometers..Nov. 132
Nonlinear function generators....Nov. 136
Induction components .....Nov. 139
Synchros .....Nov. 143
Servo motors.....Nov. 147
Speed measuring devices.....Nov. 153
Miscellaneous control components.Nov. 156
Typical application circuits.....Nov. 159
Servo mechanism components.....July 135
Servo motors .....Nov. 147
Servo systems for performing mathematical operations .....Sept. 134
Solenoid operated shutoff valves for aircraft hydraulic circuit .....Mar. 175
Speed measuring devices.....Nov. 153
Synchros .....Nov. 143
Transistor applications, experimental (abstract) .....May 310
Transistors enter commercial field..Mar. 197
Tubes for industrial inspection and control .....Feb. 182

ENGINEERING DEPARTMENT OPERATION

Break-even charts: they'll tell you if a product should be made.....Aug. 170
Choosing and evaluating research projects .....June 184
Consulting development groups....May 143
Curtailing patent rights.....Nov. 199
Dangerous new products cost manufacturers millions .....Jan. 200
Development engineer (abstract)...June 317
Dimensioning, decimal (abstract)..Aug. 279
Engineering manpower .....June 133
Engineering personnel .....Aug. 264
Engineering societies .....June 299
Engineering societies—let's keep our eye on the ball .....Oct. 148
Engineers salaries, professional.....Aug. 210
Factors of safety in tolerance specifications .....Mar. 155
Fine points in a product development program .....Jan. 129
German engineering .....July 285
Government patent groups.....Oct. 201
Government research data, industry can use .....June 200
How to evaluate assembly tolerance..Jan. 179
Industrial designers meet.....Dec. 189
Instruction manuals .....Aug. 141
Insuring your progress through research .....June 171
Organizing for industrial research.June 172
Obtaining and keeping research personnel .....June 174
Measuring effectiveness of research personnel .....June 176
Policy matters in laboratory design June 180
Choosing and evaluating research projects .....June 184
Setting up research budgets.....June 188
Patent licensing policy and procedures June 192
Role of independent research facilities June 196
Industry can use government research data .....June 200
Keeping track of projects with control boards .....Sept. 141
Low cost research to assure customer satisfaction .....May 160
Manpower program set-up for 1953..Mar. 196
Mechanics of industrial design.....Jan. 121
New patent law of 1953.....Apr. 186
Obtaining and keeping research personnel .....June 174
Organizing for industrial research..June 172
Patent licensing policy and procedures June 192
Policy matters in laboratory design..June 180
Review your products for economy..Aug. 282
Simple approach to cost estimating..July 178
Supply of engineers, stretching.....Jan. 197
Three D record keeping.....July 208
Tough training barks Russian engineers Feb. 204
Using models in design.....Sept. 177
What makes a successful design engineer .....Apr. 279

FINISHES AND COATINGS

Coatings to protect ferrous metals, wear resistant .....Mar. 146
Colored silicone finishes.....Mar. 167
Electroless plating .....May 221
Electroplating, fatigue strength and (abstract) .....Aug. 276
How tough are nickel and chromium electrodes for aluminum?.....Dec. 162
Painted-on film solves tough lubrication problems .....Jan. 181
Vacuum metallizing (abstract) ....Oct. 274

HYDRAULIC AND PNEUMATIC DRIVES AND CONTROLS

Aligning of orifices for measuring fluid flow .....Aug. 184
Basic principles of pneumatic operators .....Aug. 184
Cylinders, high pressure (abstract)..Mar. 273
Design factors for torque converter oil coolers (abstract) .....Nov. 274
Filter drain, pilot valve in float automatically operates .....Sept. 150
Hermetically sealed pump-motor units will handle any fluid.....June 216
How to prevent oil seal failure....Jan. 154
Hydraulic fluids, synthetic (abstract) Dec. 288
Hydraulic fuses (abstract) .....Sept. 306
Hydraulic motor increases grinder's sizing accuracy .....Nov. 172
Hydraulic-pneumatic automotive brake June 158
Pressure surges in hydraulic circuits Sept. 161
Integrated designs for solenoid operated shutoff valves.....May 186
Multiple fluid circuits.....Jan. 162
NBS studies high pressure pneumatics July 181
Pilot operated air control systems...May 214
Piston drives poppet in low pressure air control .....Dec. 156
Pneumatic carrier .....Dec. 154
Pneumatic safety circuits.....July 196
Comment .....Nov. 280
Pneumatic scale .....Aug. 168
Pneumatics threatens hydraulic supremacy in aircraft design.....Jan. 199
Railroad ballast cleaner goes hydraulic Oct. 150
Remote control of double-acting pneumatic cylinders .....Sept. 170
Solenoid operated shutoff valves for aircraft hydraulic circuit.....Mar. 175
Techniques for measuring and controlling vacuum .....Sept. 190
Test chamber, air jet operates environmental controls in.....Jan. 152
Turbine pumps have their niche....Aug. 172
Turbocharger increases compressor efficiency .....Oct. 158
Which characteristics for hydraulic fluid? .....Aug. 149

LUBRICATION

High-temperature lubricating fluids, evaluation of synthesized (abstract) .....June 309
Lubrication of electric motor ball bearings, high temperature (abstract) Sept. 298
Multi-purpose grease approach to lubrication .....July 174
Oil whip—what it is and how to prevent it .....Feb. 171
Oils for special lubrication problems, tailor-made .....Mar. 166
Painted-on film solves tough lubrication problems .....Jan. 181
Selecting the right plain bearing lubricant .....Mar. 134
Study of lubricant flow in bearings by streak photography .....Oct. 162
Tests for ball and roller bearing greases Mar. 160
Trolley wheel controls automatic Alemite lubricator .....July 158

MATERIALS—METALS FERROUS

Brittle structural failures with emphasis on welded ships.....Apr. 192
Coatings to protect ferrous metals, wear resistant .....Mar. 146
Castings, tolerances and specifications of malleable (abstract) .....Dec. 283
Defense materials system.....June 149
Dimensional tolerances for steel castings (abstract) .....Nov. 269
Engineering materials, new.....June 139
Fretting, mechanism of (abstract)..Aug. 272
High purity metals.....Nov. 186
High temperature non-critical materials (abstract) .....Feb. 278
High temperature test data and their importance in design.....Oct. 182
Materials shortages, protect yourself now against future .....June 146
Metal powder filters.....Apr. 179
1953 metal show.....Oct. 202
Metals, effect of pressure on tensile properties of some (abstract)..Aug. 268
Metals for atomic reactors (abstract) Dec. 292
Nomographs for designing electromagnets .....May 229
Nuclear radiation and mechanical properties of metals and plastics (abstract) .....Oct. 268
Paper-thin metals .....Jan. 138
Power steering, using new materials..Apr. 154
Properties of preloaded steel bolts..Nov. 191
Radiation characteristics of metals..Sept. 205
Residual compressive stress strengthens brittle materials .....July 189
Seizing in metal wear (abstract)...Sept. 304
Selecting forging alloys.....May 202
Shell molding of stainless steel....Sept. 129
Sprayed and sintered parts (abstract) Feb. 272
Stainless, non-galling .....July 191
Steel tubing cuts Bourdon tube rejects, chrome-moly .....Mar. 139
Sub-zero technique in engineering (abstract) .....Feb. 266
Ultra high strength steel for aircraft structures .....Oct. 129
Water treatment .....Nov. 123
Wear properties of ductile cast iron..Feb. 125

MATERIALS—METALS NONFERROUS

Aluminum, advances in (abstract)..Jan. 246
Aluminum aircraft alloys (abstract) June 308
Aluminum honeycomb sandwich structures .....Feb. 184
Aluminum structural design, cost and stress factors in (abstract)....Jan. 256
Aluminum tanks and pressure vessels Apr. 183
Cemented chrome carbides.....Aug. 154
Charts for allowable compressive stresses in aluminum and magnesium alloys June 236
Defense materials system.....June 149
Engineering materials, new.....June 139
Fretting, mechanism of (abstract)..Aug. 272
Gallium, metal of the future.....Apr. 328
High purity metals.....Nov. 186
High temperature test data.....Oct. 182
How tough are nickel and chromium electrodes for aluminum.....Dec. 182
Japan's titanium industry .....Dec. 191
Magnesium developments .....Jan. 115
Materials shortages, protect yourself now against future .....June 146
Metal powder filters.....Apr. 179
1953 metal show.....Oct. 202
Metals, effect of pressure on tensile properties of some (abstract).....Aug. 268
Metals for atomic reactors (abstract) Dec. 292
Modern continuous cast copper alloys Mar. 178
Nuclear radiation and mechanical properties of metals and plastics (abstract) .....Oct. 268
Paper-thin metals .....Jan. 138
Pump for corrosive chemicals, porcelain cylinder liner protects .....May 166
Putting the squeeze on cold welding..Feb. 176
Radiation characteristics of metals..Sept. 205
Rare metals .....Sept. 201
Residual compressive stress strengthens brittles materials .....July 189
Seizing in metal wear (abstract)..Sept. 304
Selecting forging alloys.....May 202
Specification and color coding of electrical wire .....June 219
Sprayed and sintered parts (abstract) Feb. 272
Strength of joints in titanium brazed with several alloys .....July 141
Sub-zero technique in engineering (abstract) .....Feb. 266
Titanium process, more on.....July 204
Water treatment .....Nov. 123
Zirconium, ductile welds in (abstract) July 266
Zirconium shortage eases.....May 224

MATERIALS—NON-METAL PLASTICS

Adhesives for reinforced plastics (abstract) .....Apr. 288
Colored silicone finishes.....Mar. 167
Don't under-rate nylon for mechanical components .....June 203
Electrons toughen plastics.....July 209
Engineering materials, new.....June 139

Fluorothene, properties of (abstract) May 295
High temperature properties of glass fiber phenolic laminates (abstract) Nov. 266
1953 metal show....Oct. 202
Nuclear radiation and mechanical properties of metals and plastics (abstract) ....Oct. 268
Plastic cams control automatic sewing machine ....Mar. 140
Plastic design piracy....Sept. 203
Plastic extruder, multiple screw design is basis of....July 166
Plastic filter ....June 231
Plastic moldings, large....Apr. 131
Plastic pipeline ....Dec. 280
Plastic preforming ....Nov. 198
Plastic tank trend....Oct. 203
Properties and characteristics of foamed plastic materials ....Apr. 166
Silicone putty for slip clutches and couplings ....Oct. 142
Teflon, transitions in....May 185

MATERIALS—NON-METAL MISCELLANEOUS

Common rubber materials....Jan. 203
Defense materials system....June 149
Engineering materials, new....June 139
High temperature properties of glass fiber phenolic laminates (abstract) Nov. 266
Improved electrical insulation from mica paper ....May 210
Materials shortages, protect yourself now against future....June 146
1953 metal show....Oct. 202
Metal-wood adhesives (abstract)....Jan. 251
Mica in electrical design, glass bonded (abstract) ....June 303
Rubber diaphragm replaces metal nozzle in home shower head....May 174
Rubber monopoly, synthetic....Apr. 212
Rubber packings for high temperature application, synthetic (abstract).July 274
Rubber phenolics (abstract)....Mar. 268
Rubber-to-metal joints, design of bonded (abstract) ....July 277
Tips for designing rubber parts and assemblies ....Jan. 160

MECHANICAL PARTS AND MECHANISMS

Afterburner design pays off....Apr. 215
Aluminum honeycomb sandwich structures ....Feb. 184
Aluminum tanks and pressure vessels ....Apr. 183
Cam dynamics ....Oct. 170
Camera, mechanical drives in Neoflow reducing ....May 168
Chart for determining load and life of ball and roller bearings....July 211
Check-lists for springs....Sept. 185
Converting decimal fractions into compound gear trains....June 215
Criteria for designing adhesive bonded joints ....Oct. 144
Design charts for rectangular wire helical springs ....Nov. 207
Developments in the analysis of lugs and shear pins....June 160
Dimensional allowance charts for helical wire springs....Mar. 207
Don't under-rate nylon for mechanical components ....June 203
Duplicator, timing belts drive spindles in ....May 162
Electro-mechanical counters as control devices ....May 148
Electronic ejector tray....Apr. 158
Engine control, remonte (abstract) Apr. 284
European machine tool tracer attachments ....Jan. 142
Flexure pivots—design formulas and charts ....Feb. 192
Formula for estimating wire size is revived ....Oct. 280
Fundamentals of selecting locknuts....Dec. 177
Helicopter design lowers weight and increases payload, compact....Nov. 176
Honeycomb element structure increases Geiger counter sensitivity ....Dec. 160
How fast does a spring expand....Oct. 209
How to prevent oil seal failure....Jan. 154
Hydrofoil boats ....Aug. 204
Improving fatigue resistance of bolted joints ....Apr. 190
Industrial uses of electric heating elements ....Mar. 184
Jewel bearings, precision components for quality equipment ....Aug. 186
Lubrication of electric motor ball bearings, high temperature (abstract) Sept. 298
Magnetic drum storage devices....Aug. 192
Modified Geneva drives and special mechanisms ....Feb. 174
Negators used for slot closure and counter balancing applications..July 168
New approach to compression spring design ....May 154
Noise reduction in machinery....Dec. 172
Oil whip—what it is and how to prevent it....Feb. 171
Parachute brake ....June 233
Photographic typesetter, punched cards operate new ....Apr. 218
Polygon universal grinding machine.June 154
Pop rivet fasteners for aircraft....May 191
Profile grinder, Planet....Apr. 160
Properties of preloaded steel bolts..Nov. 191
Pyrometer temperature compensation, linkage changes G. E....Aug. 162
Rotary capping machine....Oct. 156
Selecting the right plain bearing lubricant ....Mar. 134
Sheet metal design with the $ sign in mind ....Oct. 188
Sheet metal gears, sprockets, worms and ratchets ....May 208
Shock or vibration isolators....June 212
Simple method of determining ratios in planetary gear trains....Mar. 182
Small rivets for big jobs....Mar. 119
Special purpose mechanisms....Nov. 196
Spring actuated linkage analysis to increase speed ....July 152
Study of lubricant flow in bearings by streak photography ....Oct. 162
Techniques for measuring and controlling vacuum ....Sept. 190
Temperature regulators ....July 172
Tests for ball and roller bearing greases Mar. 160
Tips for designing rubber parts and assemblies ....Jan. 160
Turret unit for multiple indexing applications, standard ....Nov. 184
Water treatment ....Nov. 123
Weston instrument ....Mar. 144
Winterization of construction equipment June 150

POWER TRANSMISSION

Basic types of variable speed friction drives ....Dec. 180
British car hinges export appeal on economy ....July 162
Calculating design data from sample gears ....July 215
Design factors for torque converter oil coolers (abstract) ....Nov. 274
Design of V-belt drives for mass produced machines ....Sept. 184
Duplicator, timing belts drive spindles in ....May 162
Garden tractor drive, floating countershaft controls ....Nov. 182
Hydraulic-pneumatic automotive brake June 158
Italian truck powered by lightweight diesel engine ....Apr. 164
Mechanisms for adjusting tension of belt drives ....Oct. 168
Modified Geneva drives and special mechanisms ....Feb. 174
Motor and gear train selection for automatic control systems....Mar. 128
Multiple fluid circuits....Jan. 162
Plastic extruder, multiple screw design is basis of....July 166
Practical method for designing gear trains ....Feb. 211
Shaft mounted speed reducers....July 170
Sheet metal gears, sprockets, worms and ratchets ....May 208
Silicone putty for slip clutches and couplings ....Oct. 142
Simple method of determining ratios in planetary gear trains....Mar. 182
Special purpose mechanisms....Nov. 196
Strength-weight ratios of hollow steel shafts ....Sept. 209
Torque capacity and design of cone and disk clutches ....Dec. 182
Torque converter transmission for late Plymouth models ....June 156
Tractor weight, three-point suspension spreads ....Aug. 158
Turbocharger increase compressor efficiency ....Oct. 158
Turboprops to power transports....Oct. 200
Two-wheel V-belt drive design work sheet ....Sept. 160A
Which engine should power your equipment? ....Feb. 119
Winterization of construction equipment June 150

PRODUCT DESCRIPTIONS

Alemite lubricator ....July 158
Aligning of orifices for measuring fluid flow ....Dec. 168
1954 auto parade....Nov. 204
British car hinges export appeal on economy ....July 162
British tractor ....Aug. 158
Brown & Sharpe grinder....Nov. 172
Buick: V-8 and redesigned dynaflow.Feb. 162
Cadillac: 12 volt ignition plus record horsepower ....Feb. 156
Camera, mechanical drives in Neoflow reducing ....May 168
Camera, lightweight, underwater...Mar. 136
Chevrolet: redesigns powerglide transmission ....Feb. 160
Chrysler air-conditioner ....Nov. 180
Chrysler: one oil system for engine and converter ....Feb. 148
Contest rewards versatility in design Feb. 208
Convertiplanes ....Sept. 195
Danes design low cost auto....Jan. 200
De Jur ruggedized precision instrument July 168
Design features of 1953 cars....Feb. 135
DeSoto: stresses new body styling..Feb. 150
Dictaphone, time-master dictating machine ....Dec. 150
Dictating machine redesigned for lower weight, higher quality ....Dec. 150
Dodge: gets new look and new V-8 engine ....Feb. 152
Duplicator, Pratt & Whitney....May 162
Electro-optical instrument analyzes chemical streams with infrared..May 174
Electronic ejector tray....Apr. 158
European machine tool tracer attachments ....Jan. 142
Fiberglas reinforced plastic body car, Kaiser ....Apr. 222
Flexible diaphragm acts as pump piston Oct. 161
Ford: principal change is in the suspension system ....Feb. 140
Garbage disposer ....July 161
Garden tractor drive, floating countershaft controls ....Nov. 182
Geiger counter ....Dec. 160
German meters, circuit design feature July 164
Hannifin valve ....Dec. 156
Heat pump, G. E. ....Sept. 144
Helicopter design lowers weight and increases payload, compact...Nov. 176
Honeycomb element structure increases Geiger counter sensitivity ....Dec. 160
Hydraulic-pneumatic automotive brake June 158
Italian truck powered by lightweight diesel engine ....Apr. 164
Kaiser, Fiberglas reinforced plastic body car ....Apr. 222
Kaiser: puts emphasis on luxury styling Feb. 147
Lincoln: revs up to 205 horsepower..Feb. 136
Mercedes Benz goes American....Dec. 160
Mercury: breathes easier....Feb. 140
Military designs: are they too complex Mar. 199
Motorcycle starter acts as motor and generator, electrical ....Aug. 168
Negators used for slot closure and counter balancing applications..July 168
Oldsmobile: sturdier design for 1953.Feb. 166
Packard: more horsepower means major changes ....Feb. 142
Photographic typesetter, punched cards operate new ....Apr. 218
Piston drives poppet in low pressure air control ....Dec. 156
Plastic extruder, multiple screw design is basis of ....July 166
Plymouth: changes body and frame.Feb. 150
Plymouth: torque converter transmission for late models ....June 156
Pneumatic carrier ....Dec. 154
Pneumatic scale ....Aug. 168
Polygon universal grinding machine.June 154
Power steering ....Apr. 154
Pratt & Whitney duplicator ....May 162
Profile grinder, Planet....Apr. 160
Pump for corrosive chemicals, porcelain cylinder liner protects....May 166
Pyrometer temperature compensation, linkage changes G. E....Aug. 162
Railroad ballast cleaner goes hydraulic Oct. 150
Remington Rand business machine..Oct. 160
Rotary capping machine....Oct. 156
Rubber diaphragm replaces metal nozzle in home shower head....May 174
Russian car—old Opel Kadett, new..Nov. 184
Sewing machine, plastic cams control automatic ....Mar. 140
Simplex valve ....Dec. 158
Steel tubing cuts Bourdon tube rejects, chrome-moly ....Mar. 139
Studebaker: sport car styling for all models ....Feb. 167
Tapered rotor supplies built-in motor brake ....Mar. 146
Test chamber, air jet operates environmental controls in....Jan. 152
Tiny camera has fixed depth of field, Minox ....Apr. 163
Torque converter transmission for late Plymouth models ....June 156
Traffic controller has jack-mounted components, electro-mechanical ....May 172
Tube reducer ....Sept. 148
Turbocharger increases compressor efficiency ....Oct. 158
Turret unit for multiple indexing applications, standard ....Nov. 184
Underwater camera, lightweight....Mar. 136
Valve design extends life of pulse jet engine ....Jan. 150
Valve, flexible ....Aug. 164
Vender capacity doubled within same frame size ....Sept. 152
Water cooler, G. E. ....Aug. 166
Weston instrument ....Mar. 144
Willys: adds new models to the line.Feb. 155
Winterization of construction equipment June 150

PRODUCTION PROCESSES

Adhesive bonded joints....Oct. 144
Adhesives for reinforced plastics (abstract)....Apr. 288
Aluminum, advances in (abstract)..Jan. 246
Castings, tolerances and specifications of malleable (abstract)....Dec. 283
Curved jaw stretch forming....Aug. 196
Design tips for changing to die casting Apr. 174
Designing an ideal sand casting....Feb. 168
Designing around inert-gas metal arc welded stainless, nickel and stainless clads, copper, copper base alloys, aluminum....Apr. 171
Die casting design for easy ejection (abstract)....Apr. 283
Die castings and extrusions (abstract) Oct. 266
Dimensional tolerances for steel castings (abstract)....Nov. 269
Electroplating, fatigue strength and (abstract)....Aug. 276
Extrusion process, cold (abstract)..July 271
Forging heavy steel parts with split dies, press....Jan. 198
Fundamentals of selecting locknuts..Dec. 177
Heavy press facts....June 227
Heavy press....Oct. 204
Heavy press parts....Apr. 220
Improving fatigue resistance of bolted joints....Apr. 190
Investment castings....Apr. 137
Metal-wood adhesives (abstract)....Jan. 251
Modern continuous cast copper alloys Mar. 178
Plastic moldings, large....Apr. 131
Plastic preforming....Nov. 198
Polygon universal grinding machine.June 154
Pop rivet fasteners for aircraft....May 191
Practical approach to casting design.July 192
Project tinkertoy: it changes the electronic design concept....Dec. 134
Putting the squeeze on cold welding..Feb. 176
Recommended welding processes....Apr. 229
Ring welding cuts business machine costs....Oct. 160
Rubber-to-metal joints, design of bonded (abstract)....July 277
Selecting forging alloys....May 202
Sheet metal design with the $ sign in mind....Oct. 188
Shell molding cartel....May 223
Shell molding of stainless steel...Sept. 129
Small rivets for big jobs....Mar. 119
Soldering, production (abstract)...July 279
Strength of joints in titanium brazed with several alloys....July 141
Stretcher, most powerful....Oct. 206
Torch arc weld....May 225
Unitized designs are replacing built-up assemblies....May 199
Welding idea: braided elcetrodes...July 208
Wrap-around connections....June 230
Zirconium, ductile welds in (abstract) July 266

REFERENCE BOOK SHEETS

Analog circuit ratio chart....Dec. 209
Calculating design data from sample gears....July 215
Calculation of dihedral angles....Aug. 213
Calculator for G loadings....Dec. 213
Chart for determining load and life of ball and roller bearings....July 211
Charts for allowable compressive stresses in aluminum and magnesium alloys June 235
Common rubber materials....Jan. 203
Critical buckling shear stresses in thin cylinders....Apr. 225
Design charts for rectangular wire helical springs....Nov. 207
Dimensional allowance charts for helical wire springs....Mar. 207
Graphical aid for combined stress problems....Jan. 207
How fast does a spring expand....Oct. 209
Lateral area of right cones and pyramids Jan. 205
Nomogram for evaluating test data..Feb. 215
Nomographs for designing electromagnets....May 229
Practical method for designing gear trains....Feb. 211
Radiation characteristics of metals.Sept. 205
Recommended welding processes....Apr. 229
Strength-weight ratios of hollow steel shafts....Sept. 209

RESEARCH AND TEST METHODS

Arctic testing....July 202
Atom smashers ready to probe the nucleus, giant....Feb. 201
Atomic energy....Oct. 123
Atomic energy control....Feb. 113
Atomic energy data....June 229
Calibrating multimillion pound testing machines....Oct. 176
Choosing and evaluating research projects....June 184
Corrosion data, more....Sept. 200
Creep testing in compression for simple creep assessment....Apr. 150
Dry radiography....Dec. 191
Electronic "brain" controls lab tests.Mar. 195
Engineering manpower....June 133
Engineering societies....June 299
European research....Dec. 123
Fatigue testing—its machines and methods Pt. I....Feb. 128
Pt. II....Mar. 148
Fretting, mechanism of (abstract)..Aug. 272
German research....Aug. 207
Government security....Sept. 123
Guided missile test range....Dec. 188
Guided missiles....Mar. 113
Hermetically sealed pump-motor units will handle any fluid....June 216
High temperature test data and their importance in design....Oct. 182
Industry can use government research data....June 200
Influence of strain gradient on brittle coating sensitivity....Jan. 136
Insuring your progress through research June 171
Organizing for industrial research.June 172
Obtaining and keeping research personnel....June 174
Measuring effectiveness of research personnel....June 176
Policy matters in laboratory design June 180
Choosing and evaluating research projects....June 184
Setting up research budgets....June 188
Patent licensing policy and procedures June 192
Role of independent research facilities June 196
Industry can use government research data....June 200
Low cost research to assure customer satisfaction....May 160
Magnetic drum storage devices....Aug. 192
Measuring effectiveness of research personnel....June 176
Metals, effect of pressure on tensile properties of some (abstract)..Aug. 268
Mobile lab aids defense contractors..Apr. 296
Mock-ups for vibration and shock testing....July 186
National Bureau of Standards....May 137
NBS, changes at....Sept. 198
NBS studies high pressure pneumatics July 181
Nomogram for evaluating test data Feb. 215
Nuclear radiation and mechanical properties of metals and plastics (abstract)....Oct. 268
Nuclear system generates electricity June 224
Obtaining and keeping research personnel....June 174
Optical analysis....Apr. 217
Optical corrosion studies....July 205
Organizing for industrial research..June 172
Patent licensing policy and procedures June 192
Policy matters in design....June 180
Radioactivity speeds up industrial research....Mar. 197
Radiography, hot (abstract)....Feb. 268
Research, basic....Aug. 135
Research department....Mar. 256
Research, operations (abstract)....May 296
Role of independent research facilities June 196
Setting up research budgets....June 188
Seven methods for solving structural test problems....Sept. 172
Sr-4 gages to measure strains in wire strand....Apr. 214
Tensile testing at high and low temperatures....Apr. 197
Testing at subatmospheric temperatures, tension (abstract)....Mar. 276
U.S. research....Dec. 196
Using models in design....Sept. 177

STANDARDS AND STANDARDIZATION

Electronic equipment standardization on aircraft performance, effects of (abstract)....May 302
Measurement units, changes in (abstract) Dec. 281
NATO rearmament, lack of standardization stalls....Jan. 196
Scientists vindicate NBS....Dec. 193
Standards, Metal Powder Association Feb. 209
What the new NEMA standards mean Dec. 144

TECHNICAL ABSTRACTS

Adhesives for reinforced plastics...Apr. 288
Aluminum, advances in....Jan. 246
Aluminum aircraft alloys....June 308
Aluminum structural design, cost and stress factors in....Jan. 256
Castings, tolerances and specifications of malleable....Dec. 283
Components department aids project engineers....Sept. 310
Cylinders, high pressure....Mar. 273
Design factors for torque converter oil coolers....Nov. 274
Development engineer....June 317
Die casting for easy ejection....Apr. 283
Diecastings and extrusions....Oct. 266
Dimensional tolerances for steel castings....Nov. 269
Dimensioning, decimal....Aug. 279
Electronic equipment standardization on aircraft performance, effects of..May 302
Electroplating, fatigue strength and Aug. 276
Engine control, remote....Apr. 284
Extrusion process, cold....July 271
Fluorothene, properties of....May 298
Fretting, mechanism of....Aug. 272
High temperature non-critical materials Feb. 278
High temperature properties of glass fiber phenolic laminates....Nov. 266
Hydraulic fluids, synthetic....Dec. 288
Hydraulic fuses....Sept. 306
Improvements in transistors....Nov. 278
Lubrication of electric motor ball bearings, high temperature....Sept. 298
Magnetic amplifiers, increasing system reliability with....Mar. 265
Magnetic tape recording system....May 308
Measurement units, changes in....Dec. 281
Metal-wood adhesives....Jan. 251
Metals, effect of pressure on tensile properties of some....Aug. 268
Metals for atomic reactors....Dec. 292
Mica in electrical design, glass bonded June 303
Motors, reduced speed in a-c....May 294
Nuclear radiation and mechanical properties of metals and plastics..Oct. 268
Radiography, hot....Feb. 268
Research, operations....May 296
Rubber packings for high temperature application, synthetic....July 274
Rubber phenolics....Mar. 268
Rubber-to-metal joints, bonded....July 277
Seizing in metal wear....Sept. 304
Soldering, production....July 279
Sprayed and sintered parts....Feb. 272
Sub-zero technique in engineering..Feb. 266
Testing at subatmospheric temperatures, tension....Mar. 276
Transistor applications, experimental May 310
Vacuum metallising....Oct. 274
Zirconium, ductile welds in....July 266

AUTHORS' INDEX

ADAMS, D. K.—Motors for hazardous locations....July 148
ADLER, Milton—Silicone putty for slip clutches and couplings....Oct. 142
ALMEN, J. O.—Brittle structural failures with emphasis on welded ships Apr. 192
Residual compressive stress strengthens brittle materials....July 189
ANCELL, James E.—Noise reduction in machinery....Dec. 172
ANDERSON, Douglas G.—Cam dynamics....Oct. 170
ANDERSON, Eugene F.—Low cost research to assure customer satisfaction....May 160
ANTHONY, R. N.—Setting up research budgets....June 188

BAILEY, G. C.—Pop rivet fasteners for aircraft....May 191
BANCROFT, R. Z.—Choosing and evaluating research projects....June 184
BARTHEL, C. E., Jr.—Obtaining and keeping research personnel....June 174
BARTON, H. K.—Design tips for changing to die casting....Apr. 174
BEACH, Robin—Controlling static electricity with electrostatic neutralizers, Pt. I....Oct. 177
Pt. II....Nov. 167
BERRYMAN, J. H.—Designing around inert-gas metal arc welded stainless, nickel and stainless clads, copper, copper base alloys, aluminum Apr. 171
BISHOP, Alfred—Calculating design data from sample gears....July 215
BLACKALL, Frederick S. Jr.—Engineering societies—let's keep our eye on the ball....Oct. 148
BLAUVELT, L. C.—Temperature regulators....July 173

BRADLEY, Warren W.—Seven methods for solving structural test problems ..... Sept. 172

BREUNICH, T. R.—Fatigue testing—its machines and methods. Pt. I..Feb. 128 Pt. II..Mar. 148

BREWSTER, O. C.—Simplified analysis of complex vibration problems..Nov. 161

BRILL, E. F.—Hermetically sealed pump motor units will handle any fluid ..... June 216

BRODING, William C.—Criteria for designing adhesive bonded joints..Oct. 144

BURNS, J. R.—Investment castings: they're getting bigger..... Apr. 137

CAMERON, Randall P., Jr.—Jewel bearings, precision components for quality equipment ..... Aug. 186

CHADBOURNE, William—Don't underrate nylon for mechanical components ..... June 203

CHYLE, John J.—Recommended welding processes ..... Apr. 229

CLEVELAND, Rex—A simple approach to cost estimating..... July 178
Review your products for economy ..... Aug. 282

COBB, Allen L.—Safety suggestions for pneumatic circuits ..... Nov. 280

CODY, D. J.—Capacitor commutator tachometers ..... July 182

CORRAL, J. S.—Curved jaw stretch forming ..... Aug. 196

CREDE, Charles E.—Mock-ups for vibration and shock testing..... July 186

CROSS, Howard C.—High temperature test data and their importance in design ..... Oct. 182

CRUMP, R. E.—Film-type heating elements ..... Oct. 164

DAVIS, Sidney—Performance characteristics of the induction generator tachometer ..... Jan. 168
Contactor amplifiers for automatic control ..... Mar. 186
Circuits and applications of contactor control devices..... Apr. 204
Rotating components for automatic control ..... Nov. 129

DAY, Robert E.—Shell molding of stainless steel ..... Sept. 129

De LaHAYE, Charles—Color blindness relative to use of color-coded wire ..... Sept. 280

DEVER, H. F.—The facts about automation ..... Dec. 129

DUNHAM, R. M.—Selecting the right plain bearing lubricant..... Mar. 134

DUNN, Walter H.—Shell molding of stainless steel ..... Sept. 129

DURELLI, A. J.—Influence of strain gradient on brittle coating sensitivity ..... Jan. 136

EDEN, J. J.—Critical buckling shear stresses in thin cylinders..... Apr. 225

ELDER, W. E.—Keeping track of projects with control boards..... Sept. 141

ENEY, W. J.—Using SR-4 gages to measure strains in wire strand..Apr. 214

ERGLE, R. P. C.—Pop rivet fasteners for aircraft ..... May 191

FERONI, C. C.—Fundamentals of selecting locknuts ..... Dec. 177

FLICK, B. B.—Which characteristics for hydraulic fluid? ..... Aug. 149

FLOYD, F. K.—Capacitor commutator tachometers ..... July 182

FRANCK, Robert J.—A practical approach to casting design..... July 192

FUCHS, Abraham M.—Motor and gear train selection for automatic control systems ..... Mar. 128

GAGNE, A. F., Jr.—Torque capacity and design of cone and disk clutches ..... Dec. 182

GATEWOOD, B. E.—Charts for allowable compressive stresses in aluminum and magnesium alloys..June 235

GEPFERT, Joseph H.—Mechanisms for adjusting tension of belt drives..Oct. 168

GLASER, M. A.—Colored silicone finishes ..... Mar. 167

GLICK, Phillip—Metal powder filters ..... Apr. 179

GOLZ, Herb C.—Sheet metal design with the $ sign in mind..... Oct. 188

GOODMAN, Thomas P.—Spring actuated linkage analysis to increase speed ..... July 152

GORDON, Robert M.—Small rivets for big jobs ..... Mar. 119

GRAY, Henry C.—Square root extraction ..... Mar. 286
Converting decimal fractions into compound gear trains..... June 215

GREEN, John C.—Industry can use government research data..... June 200

GREIWE, E. F.—What the new NEMA standards means ..... Dec. 144

GRIFFETH, R. L.—Improved electrical insulation from mica paper....May 210

GRONNER, Alfred—Circuits and applications of contactor control devices ..... Apr. 204

GROSSMAN, Norman—Putting the squeeze on cold welding..... Feb. 176

HARRIS, LeRoy S.—Chart for determining load and life of ball and roller bearings ..... July 211

HATCH, John P.—A graphical aid for combined stress problems..... Jan. 207

HELLER, S. R., Jr.—Lateral area of right cones and pyramids..... Jan. 205

HENDERSON, Keith W.—Nomographs for designing electromagnets..May 229

HENRY, R. L.—Project tinkertoy: it changes the electronic design concept ..... Dec. 134

HICKS, Fred W.—Remote control of double-acting pneumatic cylinders ..... Sept. 170

HOBLIT, F. M.—Developments in the analysis of lugs and shear pins..June 160

HOLT, John—Don't under-rate nylon for mechanical components .....June 203

IMMEL, Ralph B.—Cathode-ray tube circuits for voltage and current analysis ..... Jan. 182
Tubes for industrial inspection and control ..... Feb. 182

ISENBARGER, R. O.—How to prevent oil seal failure..... Jan. 154

JAMES, H. D.—Compound characteristics from shunt wound machines ..... Mar. 164

JAMES, J. H.—How tough are nickel and chromium electrodes for aluminum? ..... Dec. 162

JOHNSON, R. H.—How to evaluate assembly tolerances ..... Jan. 179

JOHNSON, William W.—Calculation of dihedral angles ..... Aug. 213

JONES, Kendall—Solenoid operated shutoff valves for aircraft hydraulic circuits ..... Mar. 175
Integrated designs for solenoid operated shutoff valves ..... May 186

KAPLAN, Julius Y.—Servo damping techniques ..... Oct. 192

KELSO, John—Protect yourself now against future materials shortages ..... June 146

KENDALL, George—Fine points in a product development program..Jan. 129

KENNEDY, J. D.—Cemented chrome carbides ..... Aug. 154

KIMBERLY, J. L.—Modern continuous cast copper alloys..... Mar. 178

KLIEVER, W. H.—Choosing and evaluating research projects..... June 184

KOERPER, Erhardt C.—Organizing for industrial research ..... June 172

KOLNO, Frank J.—Study of lubricant flow in bearings by streak photography ..... Oct. 162

LANGHAMMER, A. J.—Metal powder filters ..... Apr. 179

LINK, George H.—The multi-purpose grease approach to lubrication..July 174

LIST, B. H.—Analogous systems in engineering design ..... Jan. 184

LOEWER, A. C., Jr.—Using SR-4 gages to measure strains in wire strand ..... Apr. 214

LOGAN, George H.—What makes a successful design engineer..... Apr. 279

McADIE, C. H.—An analog circuit ratio chart ..... Dec. 209

McCLOSKEY, E. J.—Shaft mounted speed reducers ..... July 170

McCONVILLE, H. A.—Tests for ball and roller bearing greases..... Mar. 160

McMASTER, R. C.—Analogous systems in engineering design..... Jan. 184

MacCUTCHEON, R. H.—Patent licensing policy and procedures..... June 192

MAIER, K. W.—A new approach to compression spring design..... May 154

MARKOWITZ, J.—Shock or vibration isolators ..... June 212

MARSCHNER, Charles F.—Unitized designs are replacing built-up assemblies ..... May 199

MAYKUTH, Daniel J.—High purity metals ..... Nov. 186

MEAGLEY, Nelson G.—Factors of safety in tolerance specifications ..... Mar. 155

MELCON, M. A.—Developments in the analysis of lugs and shear pins ..... June 160
Ultra high strength steel for aircraft structures ..... Oct. 129

MERRILL, R. L.—Analogous systems in engineering design ..... Jan. 184

MILBRATH, A. F.—Which engine should power your equipment?..... Feb. 119

MILLER, E.—Colored silicone finishes ..... Mar. 167

MILO, Henry—Basic principles of pneumatic operators ..... Aug. 184

MITCHELL, K. W.—Tensile testing at high and low temperatures..... Aug. 197

MURRO, Haim—Sheet metal gears, sprockets, worms and ratchets..May 208
Basic types of variable speed friction drives ..... Dec. 180

NACHOD, Carl P.—Formula for estimating wire size is revived..... Oct. 280

NOODLEMAN, Samuel—Dynamic braking of squirrel cage motors....Aug. 178

O'HARA, W. W.—Techniques for measuring and controlling vacuum..Sept. 190

OKUBO, S.—Influence of strain gradient on brittle coating sensitivity....Jan. 136

OLMORE, Arthur B.—Turbine pumps have their niche ..... Aug. 172

PAIGE, Henry—How tough are nickel and chromium electrodes for aluminum? ..... Dec. 162

PERKINS, Robert L.—Magnetic drum storage devices ..... Aug. 192

PETTIT, James A., Jr.—Specifications and color coding of electrical wire ..... June 219

PICKENS, Dewitt H.—The analog computer ..... May 176

POGGIE, Joseph—Radiation characteristics of metals ..... Sept. 205

RAMRATH, J. M.—How fast does a spring expand? ..... Oct. 209

RAPPAPORT, Sigmund — Modified Geneva drives and special mechanisms ..... Feb. 174
Simple method of determining ratios in planetary gear trains..... Mar. 182
Special purpose mechanisms....Nov. 196

RAYBURN, C. C.—Project tinkertoy: it changes the electronic design concept ..... Dec. 134

REID, J. G., Jr.—Project tinkertoy: it changes the electronic design concept ..... Dec. 134

RICHARDS, Archer W.—Consulting development groups ..... May 143

ROBERTS, C. C.—Techniques for measuring and controlling vacuum..Sept. 190

SAGE, Ira M.—Making machines remember ..... Apr. 141

SCHUETTE, W. A.—Break-even charts: they'll tell you if a product should be made ..... Aug. 170

SHARPNACK, E. V., Sr.—Aluminum tanks and pressure vessels..... Apr. 183

SHERMAN, Monroe—Paper-thin metals ..... Jan. 138

SMISLOVA, A.—Using SR-4 gages to measure strains in wire strand..Apr. 214

SMITH, Hans W.—Strength-weight ratios of hollow steel shafts....Sept. 209

SMITH, L. W.—Strength of joints in titanium brazed with several alloys ..... July 141

SODARO, Joseph F.—Calculator for G loadings ..... Dec. 213

SPENCER, Lester—Selecting forging alloys ..... May 202

SPOTTS, M. F.—Practical method for designing gear trains ..... Feb. 211

STARK, H. J.—Properties and characteristics of foamed plastic materials ..... Apr. 166

STEWART, H. L.—Multiple fluid circuits ..... Jan. 162
Pilot operated air control systems ..... May 214
Pneumatic safety circuits ....July 196
Comment ..... Nov. 280

STEWART, W. C.—Properties of preloaded steel bolts ..... Nov. 191

SUITS, C. G.—Measuring effectiveness of research personnel ..... June 176

SULLY, A. H.—Creep testing in compression for simple creep assessment ..... Apr. 150

SVERDRUP, Nils M.—Pressure surges in hydraulic circuits .. .. Sept. 161

TATARINOV, Victor—Dimensional allowance charts for helical wire springs ..... Mar. 207
Design charts for rectangular wire helical springs ..... Nov. 207

THORP, Arthur G. II—Flexure pivots—design formulas and charts....Feb. 192

TIMO, D. P.—Oil whip—what it is and how to prevent it..... Feb. 171

TOULMIN, H. A., Jr.—New patent law of 1953 ..... Apr. 186

TREVITHICK, T. H.—Designing an ideal sand casting ..... Feb. 168

VAN SICKLE, R. C.—Spring actuated linkage analysis to increase speed ..... July 152

VARNUM, Edward C.—Nomogram for evaluating test data..... Feb. 215

VIDOSIC, J. P.—Improving fatigue resistance of bolted joints..... Apr. 190

VISIN, R. J.—Electro-mechanical counters as control devices ..... May 148

WALL, Ernest—Servo systems for performing mathematical operations ..... Sept. 134

WALL, Henry R.—Designing curved surfaces ..... Dec. 168

WANK, Roland A.—Policy matters in laboratory design ..... June 180

WIGHT, John W.—Instruction manuals ..... Aug. 141

WILLIAMS, F. S.—How tough are nickel and chromium electrodes for aluminum? ..... Dec. 162

WILLIAMS, Sidney B.—Square root without a calculating machine..May 213

WORLEY, William Spencer—Design of V-belt drives for mass produced machines ..... Sept. 154
Two-wheel V-belt drive design worksheet (gatefold) ..... Sept. 160A

YERKOVICH, L. A.—Strength of joints in titanium brazed with several alloys ..... July 141

YOUNGLOVE, B. R.—Improved electrical insulation from mica paper..May 210

ARTICLE INDEX

ANNUAL HANDBOOK OF PRODUCT DESIGN FOR 1954

SECTION A—GENERAL ENGINEERING

Instruction Manuals by John W. Wight ..... A 3
Simplified Drafting ..... A 10
Radioisotopes—Seeing Eyes for Hidden Data by G. D. Calkins and R. L. Belcher ..... A 14
The New Patent Law of 1953 by H. A. Toulmin, Jr. ..... A 18
Simple Answers to "What Will It Cost" by George Kendall ..... A 22
Developments to Watch ..... A 27
New Books ..... A 42

SECTION B—METALS AND ALLOYS

Try Aluminum Honeycomb Sandwich Structures ..... B 3
Designers' Introduction to Zirconium ..... B 8
How to Work Zirconium by R. B. Gordon and W. J. Hurford ..... B 13
Heat Resistant Casting Alloys ..... B 17
Checklist: Applications of Metals and Their Alloys ..... B 20
How to Use and Fabricate Type 430 Stainless Steels ..... B 22
New Ideas in Composite Metals by Jerry Ottmar ..... B 26
Powdered Metals—New Uses May Surprise You ..... B 28
Paper-Thin Metals—Availability Stimulates Design by Monroe Sherman ..... B 32
Developments to Watch ..... B 35
New Books ..... B 72

SECTION C—NON-METALLIC MATERIALS AND FINISHES

Properties and Uses of Fluorocarbons ..... C 3
Glass-Reinforced Polyester Molding Compounds by Albert G. H. Dietz ..... C 10
New Synthetic Finishes for Metal Products ..... C 12
Organic Barriers for Corrosive Protection of Metals ..... C 14
Choosing Thermal Insulation Materials by Ray Thomas and W. C. Turner ..... C 23
Mechanical and Electrical Properties of Ceramics ..... C 26
Developments to Watch ..... C 28
New Books ..... C 68

SECTION D—FABRICATION AND PRODUCTION PROCESSES

Precision Casting of Large Parts by J. R. Burns ..... D 3
Designing Stampings for Economy ..... D 6
Problems in the Design of Large Forgings ..... D 12
Checkpoints for Practical Forging Design ..... D 16
Choosing Aluminum Alloy Castings by Floyd A. Lewis ..... D 20
A Survey of Shell Molding Problems by B. N Ames, S. B. Donner and N. A. Kahn ..... D 26
Cold Extrusion of Metals ..... D 30
Spinning vs Drawing by John W. Lengbridge ..... D 34
Developments to Watch ..... D 37
New Books ..... D 78

SECTION E—POWER TRANSMISSION

Dynamic and Static Friction Forces in Cable-Pulley Systems ..... E 3
Magnetic Particle Clutches for Power Transmission . . . Torque Control by W. G. Martin II ..... E 8
Sheet Metal Gears, Sprockets, Worms and Ratchets by Haim Murro ..... E 12
Designing Gear Trains for Minimum Inertia by Edward G. Burgess, Jr. ..... E 14
Selecting Motor-Mounted Magnetic Brakes by J. Aude ..... E 21

Modified Geneva Drives and Special Mechanisms by Sigmund Rappaport ..... E 26
Effect of Dirty Oil on Bearings by Arvid E. Roach ..... E 28
Developments to Watch ..... E 32
New Books ..... E 94

SECTION F—MECHANICAL PARTS AND DESIGN ANALYSIS

The New Trends in Heat Exchangers by Julian C. Smith ..... F 3
Round Bar Slides for Machines by W. A. S. Douglas ..... F 8
Tips for Designing Rubber Parts and Assemblies ..... F 12
Flexure Pivots—Design Formulas and Charts by Arthur G. Thorp, II ..... F 14
Swaged Housing Ring Grooves to Retain Axial Thrust Bearings by C. H. Avery and A. G. Brisack ..... F 20
A New Approach to Compression Spring Design by K. W. Maier ..... F 24
Unusual Uses for Helical Wire Springs by Haim Murro ..... F 30
Thirteen Ways to Use Metallic Bellows by E. Perry Cumming ..... F 32
Developments to Watch ..... F 34
New Books ..... F 78

SECTION G—FASTENING AND JOINING

How the Unified Screw Thread System Will Be Revised by T. Affleck ..... G 3
Small Rivets for Big Jobs by Robert M. Gordon ..... G 6
How to Design Parts That Assemble and Lock by Twisting ..... G 10
How Service Requirements Govern Design of Brazed Joints by W. J. Van Natten ..... G 12
Methods of Attaching Glass to Metal Structures by M. H. Hunt ..... G 16
Cold Welding of Aluminum by Norman Grossman ..... G 18
Fundamentals of Resistance Welding by Lester F. Spencer ..... G 23
Information on Pressure Type Connection by R. F. Mallina ..... G 35
Developments to Watch ..... G 39
New Books ..... G 74

SECTION H—MOTORS, ENGINES, AND CONTROLS

The Torque Motor As a Control Device by Robert Kaplan and Albert J. Brotz ..... H 3
New NEMA Dimensions for Integral Horsepower Motors ..... H 8
Selection Guide for Small Motors ..... H 10
Selection and Operation of Error Measuring Devices, Servo Motors, and Servo Controllers by Ernest Wall H 13
The Significance of WK^2 and How to Calculate It by John W. Harper ..... H 24
Selecting Small Air Cooled Engines by A. F. Milbrath ..... H 32
Speed Governors for Internal Combustion Engines by Edgar J. Kates ..... H 36
Developments to Watch ..... H 40
New Books ..... H 78

SECTION I—ELECTRICAL AND ELECTRONIC COMPONENTS

Electrical Symbols and Standards ..... Following I 2
Fundamental Electronic Circuits by R. B. Immel ..... I 3
Fundamentals of Transistor Action ..... I 18
Tantalytic Capacitors for Low Voltage Use by L. W. Foster ..... I 21
The Precision Potentiometer As a Voltage Divider by H. A. Schmidt ..... I 26
Developments to Watch ..... I 30
New Books ..... I 114

SECTION J—HYDRAULIC AND PNEUMATIC EQUIPMENT

Pressure Surges in Hydraulic Systems by Nils M. Sverdrup ..... J 3
How to use Air Motors ..... J 12
Seal and Valve Design for Vacuum Systems ..... J 16
Safety Circuits for Hydraulic Machines by H. L. Stewart ..... J 18
Significance of Separation in Hydrodynamic Design by C. C. Perry ..... J 24
The Latest Development: Flowed-in Gaskets by W. M. Rand, Sr ..... J 30
Developments to Watch ..... J 32